

DIVISION OF ENVIRONMENT  
QUALITY MANAGEMENT PLAN

PART III

STORAGE TANK PROGRAMS  
QUALITY ASSURANCE MANAGEMENT PLAN

Revision 3  
December 19, 2005

Kansas Department of Health and Environment  
Division of Environment  
Bureau of Environmental Remediation  
Curtis State Office Building  
1000 SW Jackson, Suite 410  
Topeka, Kansas 66612-1367

## Concurrences and Approvals

### Concurrences, KDHE Division of Environment, Bureau of Environmental Remediation

Name: Randy Carlson  
Title: Section Chief, Storage Tank Section

Signature\_\_\_\_\_ Date\_\_\_\_\_

Name: Bill Morris  
Title: QA Representative, Bureau of Environmental Remediation

Signature\_\_\_\_\_ Date\_\_\_\_\_

Name: Gary Blackburn  
Title: Director, Bureau of Environmental Remediation

Signature\_\_\_\_\_ Date\_\_\_\_\_

## TABLE OF CONTENTS

<u>Section</u>	<u>Revision No.</u>	<u>Date</u>
1 INTRODUCTION		
1.1 Purpose of Plan .....	3	12/19/05
1.2 Plan Revisions .....	3	12/19/05
2 DESCRIPTION OF PROGRAM		
2.1 Historical Overview .....	3	12/19/05
2.2 Mission and Goals .....	3	12/19/05
2.3 Organization and Responsibilities .....	3	12/19/05
3 QUALITY ASSURANCE POLICY STATEMENT		
4 QUALITY ASSURANCE CRITERIA AND PROCEDURES		
4.1 Field Station Site Selection .....	3	12/19/05
4.2 Field Equipment Installation .....	3	12/19/05
4.3 Sampling Types .....	3	12/19/05
4.4 Safety Consideration .....	3	12/19/05
4.5 Requesting Analytical Services .....	3	12/19/05
4.6 Procedures for Assessing Data Precision, Accuracy, Representativeness and Comparability .....	3	12/19/05
4.6.1 Ongoing Quality Assurance Review and Special Audits .....	3	12/19/05
4.6.2 Instrument Calibration and Maintenance ..	3	12/19/05
4.6.3 Quality Control Blanks and Spikes .....	3	12/19/05
4.7 Corrective Action Procedures .....	3	12/19/05
4.8 Data Management .....	3	12/19/05
4.9 Quality Assurance/Control Reporting Procedures .	3	12/19/05
APPENDICIES .....	3	12/19/05

\* Refer to State Cooperative and State Deferral Programs for the Bureau's Standard Operating Procedures (SOP's) used in this Program Plan.

## **Section 1**

### **INTRODUCTION**

#### **1.1 Purpose of Plan**

This document presents the quality assurance management plan for the Storage Tank Programs. The plan describes the mission, developmental history, organizational structure, environmental monitoring protocols, data handling procedures, and quality assurance (QA) / quality control (QC) requirements of these programs. Standard operating procedures (SOPs) and equipment used in the programs are presented in the Appendix A.

#### **1.2 Plan Revisions**

To be effective and useable, this document must be maintained in an up-to-date condition. As required by the Division of Environment Quality Management Plan (Part I, section 7), the contents of the plan are reviewed on at least an annual basis. Minor changes in the report's organizational structure or terminology may be approved by the Section Chief. However, major revisions which substantially change the content of the document, especially in terms of QA policies or procedures, require the added approval of the Bureau QA Representative and the Bureau Director.

## Section 2

### DESCRIPTION OF PROGRAM

#### 2.1 Historical Overview

KDHE began regulating Underground Storage Tanks (USTs) on May 1, 1981 with the passage of Article 44. Amendments to the Resource Conservation and Recovery Act (RCRA) during 1984 provided the federal Environmental Protection Agency (EPA) with authority to develop regulations pertaining to USTs although federal regulations did not become effective until 1988. The Kansas legislature enacted the Kansas Storage Tank Act in 1989 which provided KDHE with authority to adopt the federal regulations.

The federal rules contained several facets which include, registration, release detection, corrective action, financial responsibility, upgrading requirements for corrosion protection and spill and overfill protection. Due to the very large scope of this program, the different program segments were phased in to allow the regulated community time to develop resources to satisfy the requirements.

The EPA required that each owner/operator (O/O) provide liability insurance for each UST which remains in use. In response to the federal requirements, the Kansas petroleum industry found that private insurance was not available to most O/O and was very expensive for those who could obtain the coverage. Any insurance coverage provided by private insurance would most definitely not cover the past releases which occurred prior to insurance coverage. With this in mind, the Kansas Legislature created the Kansas Petroleum Storage Tank Release Trust Fund (UST Fund). The UST fund solved several problems by providing the required pollution liability coverage for active USTs to remain in service and to provide funding for corrective action in response to many of the past releases. In addition, a reimbursement fund was also created for Aboveground Storage Tanks (ASTs) called the AST fund.

The Storage Tank Section is divided into six units: LUST / Investigation Unit, Remedial Unit, Contractual Services Unit, Wellhead Protection Unit, Groundwater Monitoring Unit and Storage Tank Compliance Unit. The functions of each unit within the Storage Tank Section are similar in various aspects.

#### 2.2 Mission and Goals

The federal regulations, as developed, allow the states a great deal of flexibility to craft programs which fit the problems of the particular state. The deadlines and basic tasks were outlined, however, many of the program details were left to the state's discretion. The basic elements of the federal program are the preventative program, financial responsibility program, and the Leaking Underground Storage Tank (LUST) Trust Fund. The financial responsibility requirements are satisfied within Kansas by the UST fund. The AST fund is a similar program which was established

for ASTs. The collective goals for the various programs are summarized below:  
The goals of the UST preventative program are:

1. enforce the release detection rules which require O/Os of all USTs to provide a method of release detection for all USTs and associated lines to insure that active systems are not releasing product into the environment. KDHE provides O/Os with several options to meet this requirement.
2. require that all USTs be registered with KDHE to track compliance with program requirements. Registration data is used to provide information to EPA and the Community Right-to-Know Program.
3. conduct an installer, remover, and tester licensing program to insure that companies and individuals who provide services to O/Os are trained and carry required insurance. In addition, plans to install, upgrade, or modify UST systems must be submitted for review and approval prior to the work being performed. Staff provide periodic inspections to insure compliance with requirements.
4. KDHE provides ongoing communication with O/Os to provide notice of current requirements which include corrosion protection, spill protection and overflow protection requirements. All of the UST requirements have already been phased in and are reiterated in mass mailings and other outreach documents.
5. annual permits are issued for each UST which meets the requirements to remain in service. As part of the mass mailings, O/Os are notified of the requirements to maintain their UST permits. If permits are allowed to lapse, fuel distributors are unable to lawfully deliver fuel to the un-permitted tanks.
6. registration and permitting are required for ASTs as well. At present, ASTs are not required to perform any routine testing.

The corrective action portion of the Storage Tank Program is divided into five areas. Those areas are the LUST/Investigation Unit, the Remedial Unit, the Wellhead Protection Unit, the Groundwater Monitoring Unit and the Contractual Services Unit.

Program goals of the LUST/Investigation Unit are:

- (1) coordinates site assessment activities for UST and AST sites. Based on the site priority, the order and type of assessment is determined. Sites are assessed in order of their priority ranking score, with higher ranking sites being assessed first.
- (2) utilize the Risk Based Corrective Action (RBCA) process to evaluate low priority sites to determine if closure is acceptable due to limited environmental or public risk.

- (3) evaluate and approve for removal and treatment of contaminated soil where removal and treatment represent a viable and cost effective remedial option.
- (4) review release reports to insure that activities are consistent with KDHE policies. Information from these reports is entered onto a data base to track the site through the corrective action process. EPA quarterly reporting information is derived from the data base.
- (5) initiate emergency response activities through state contracted consultants and O/O to resolve emergencies linked to releases from USTs and ASTs.
- (6) coordinate compliance activities to obtain required action from an O/O who refuses to perform corrective action. Letters and directives are issued to an O/O requesting corrective action prior to requesting legal action.
- (7) perform site ranking to establish a priority score for sites worked by the program. Scoring is performed from BTLA (buried tank leak assessment) reports submitted by district staff, data from the Kansas Water Data base, and Kansas Geological Survey Bulletins. This ranking will determine the relative order in which sites are addressed.
- (8) perform federally funded state lead investigations and remedial activities as dictated by the site priority score.
- (9) consider cost recovery actions for each site where federal funds are expended for corrective action. Staff interact with legal services to review files and negotiate with O/Os as to their financial obligations in the remedial process.
- (10) review and generate reports to satisfy information requests made by the public.

The goals of the Remedial Unit are defined as follows:

- (1) evaluate and review the investigation data and determine what additional information is needed before a remedial system can be designed for the site. In addition, the project manager will review the risk to the public to insure that the threat is actual before implementing remedial activities.
- (2) prepare remedial design bid documents which describe the additional work needed to confirm the data and design a remedial system. Following the preparation of the bid documents, the Contractual Services Unit obtains bids from qualified bidders for each site.
- (3) review the remedial design workplan once submitted to insure that the consultant's plan is acceptable. The project manager will conduct periodic inspections to insure

the consultant is complying with the workplan.

- (4) communicate throughout the design phase with the consultant and the Technical Services Unit of the Bureau. The project manager reviews the remedial design plan (RDP) once submitted to insure that all of the required information is provided and the document is ready for bidding.
- (5) review the remedial system implementation schedule to insure that the consultant's plan is acceptable. Once the schedule is approved, the contractor must install the system within 90 days. The system must be operational within 120 days.
- (6) Provide oversight of construction activities.

The goals of the Contractual Services Unit are defined as follows;

- (1) execute and oversee the bidding process as required by statute and the reimbursement of the O/O for eligible expenses.
- (2) insure that all bills are submitted to KDHE by the O/O in the required format. The reimbursements may be issued as co-pay to the O/O and the consultant to avoid tying up the O/O's resources. Reimbursements should be made within two weeks of receiving a request.
- (3) review and approve applications for financial assistance from both the UST and AST funds. These applications are reviewed and approved if the O/O meets the criteria for participation.
- (4) track the financial status of the funds to maintain an unencumbered balance of between \$2,000,000 and \$5,000,000. If the balance of the UST fund exceeds the upper level, collection of the tax is suspended until the balance drops below \$2,000,000. Program income and expenses are monitored to insure the funds remain solvent.
- (5) negotiate a consent agreement between KDHE and the O/O prior to providing reimbursement. Consent agreements establish the responsibilities of the O/O and KDHE.
- (6) track individual site information to insure that deadlines and other requirements are met.

The goals of the Well Head Protection Unit are similar to the remedial unit. Additional responsibilities include:

- (1) specific attention to high ranking sites where public or private water supplies are impacted or are threatened.



- (2) Organize and update public water supply information into a useable format and make that information available to the agency.

The goals of the Groundwater Monitoring Unit are defined as follows;

- (1) Coordinates long term monitoring and natural attenuation activities for UST and AST sites.
- (2) Evaluate and review consultant's monitoring activities. The frequency of monitoring is based on public risk and site conditions. Groundwater monitoring results are utilized in determining remedial options for the site.
- (3) utilize the Risk Based Corrective Action (RBCA) process to evaluate low priority sites to determine if no further action is acceptable due to limited environmental or public risk.
- (4) coordinate the implementation of limited remedial scopes of work when monitoring information indicates a change in site conditions.
- (5) implement separate phase hydrocarbon removal at sites where recovery is technically possible.
- (6) provide field services for the section.

## 2.3 Organization and Responsibilities

### ORGANIZATIONAL CHART

(See Exhibit 1 in the BER QA Plan Part II))

The Bureau Manager's responsibilities are defined in Part II of the Bureau Quality Assurance Plan.

The Section Chief is responsible for supervising the Unit Managers of the Storage Tank Section and for coordination between the units. Additionally, the Section Chief is responsible for much of the planning and policy making within the section.

The Unit Managers are responsible for managing the program elements to ensure that the requirements of QA management plans and SOPs are implemented consistently within their units. Working with the Section Chief, the Unit Managers will strive to maintain accurate and reliable data within their program element.

The LUST / Investigation Unit, the Wellhead Protection Unit, the Groundwater Monitoring Unit and the Remedial Unit are responsible for oversight of most of the functions pertaining to the QA/QC program, however, the staff responsibilities of all units have been included.

- (1) The UST preventative program staff responsibilities fall into three areas, 1) education, 2) registration and 3) enforcement.
- (2) the LUST element of the LUST / Investigation Unit (which includes elements of both the federal LUST and state fund investigation staff) program responsibilities include; 1) priority ranking, 2) management of investigation and remedial projects, 3) coordination of emergency response activities at LUST sites, 4) determine appropriateness of the use of federal funds and 5) field duties that range from gathering environmental samples to obtaining background information of selected properties.
- (3) the Investigation element of the LUST / Investigation Unit responsibilities include 1) provide regulatory oversight on trust fund site investigations 2) develop scopes of work for trust fund site investigations to determine the extent of contaminants present at a site, 3) review site investigation work plans for accuracy, adherence to present program policies and state regulations, 4) provide field oversight of investigative activities to ensure work is performed according to program guidelines and appropriate SOPs, 5) review final reports of site investigations to ensure work is performed in accordance with program regulations and to verify that the goals of the investigations are met, 6) communicate and coordinate with Remedial and Wellhead Protection Units to determine the next phase of work to be performed at the site following the investigation, 7) review, negotiate, and approve all additional work and associated cost to achieve the objectives of field investigations.
- (4) The Remedial Unit and the Wellhead Protection Unit program staff responsibilities include 1) provide regulatory oversight on trust fund remedial designs and implementations, 2) prepare bid documents outlining the scope of work necessary to design a remedial system, 3) review remedial design work plans for accuracy, technical adherence to program policies, and state and federal regulations, 4) provide oversight of field activities to ensure work is performed in accordance with program guidelines and appropriate SOPs, 5) evaluation of remedial design plans to ensure work is performed in accordance with program regulations and to verify that the goals of the scope of work are met, 6) review remedial system implementation schedule for accuracy, technical adherence to program policies, state and federal regulations, and the remedial design plan, 7) provide oversight of implementation activities to ensure work is performed in accordance with program guidelines, the remedial design plan and the applicable SOPs, and 8) evaluation of monthly and quarterly operation, maintenance and monitoring reports for system performance and efficiency.

- (5) The Groundwater Monitoring Unit program staff responsibilities include ; 1) provide regulatory oversight for groundwater monitoring and natural attenuation scopes of work for state and federal trust fund sites, 2) prepare bid and renewal documents to facilitate the groundwater monitoring activities at trust fund sites, 3) plan and execute field duties to perform various environmental sampling, recovery or maintenance at trust fund or other sites where the agency is providing oversight, 4) provide equipment inventory, disposal and maintenance for the section and bureau and 5) conduct risk analyses for remedial evaluation at low risk sites.
- (6) The Contractual Services program staff responsibilities include 1) review bids to determine the lowest approved bid, 2) evaluate consultant qualifications and past performance to insure minimum criteria are met before bids are approved, 3) evaluate invoices to determine if the costs are consistent with the pre-approved costs.

### Section 3

## QUALITY ASSURANCE / CONTROL POLICY STATEMENT

Project managers review work plans and reports to insure that work is performed in accordance with the standard operating procedures for storage tank activities and program QA/QC requirements. The role that the project managers serve is to review work plans and reports for investigative and remedial activities conducted by the consultants for the O/O. The review is very detailed to insure that the consultant has met the objectives of the bid document which KDHE has prepared for the site. If the objectives have not been met, the consultant will be required to correct the data gaps before the project is approved and ultimately being compensated. Consistent failure on the consultant's part may result in the disqualification of that consultant from future trust fund participation. The SOPs, which pertain to the specific type of work to be performed, must be followed as part of these requirements.

For trust fund investigation activities, SOPs and QA/QC requirements are set forth in the Limited Site Assessment Request For Proposal (LSA RFP) Rev. 30, Jan./2005, document that is provided to consultants with the remainder of the bid documents. LUST element SOPs and QA/QC requirements are set forth in the contract, and reiterated in individual work orders, between KDHE and those consultants that have entered into a time and materials agreement with the agency. The contract is renewed on a three year cycle at which time interested vendors provide line item costs to perform work under the agreements and conditions set forth in the contract document.

Work that is overseen by the remedial unit is governed by two documents, both of which set forth SOPs and QA/QC requirements. The Remedial Design Report/Plan Request for Proposal (RDP RFP) rev. 9, 09/03 and the Site Remedial Plan Request for Proposal (SRP RFP) rev. 9, 09/05. These documents are provided to the consultant with the remainder of the bid site specific documents.

Project managers are responsible for the collection of split, duplicate, or collocated environmental samples to ensure the representativeness and general quality of the various samples collected at a site throughout the investigative and remedial activities. All sampling activities conducted by Storage Tank Section project managers, technicians and contractors comply with the following program policies:

- (1) The objectives of any environmental investigation or monitoring project shall be determined prior to implementation of data collection activities. This determination shall be accomplished during the planning stage of the project so that appropriate procedures will be incorporated into the design of the project to insure the resulting data will meet the stated objectives. The planning activities would correspond to the level of importance of the project.

- (2) Sample collection and analysis activities and data management activities shall be subjected to periodic evaluation by supervisory personnel to identify and correct deficiencies and enhance the overall credibility of the Section's environmental monitoring programs.
- (3) All data collection activities will be accomplished and documented in accordance with a divisional QA plan and applicable SOPs, included in Appendix A.

## Section 4

### QUALITY ASSURANCE / CONTROL CRITERIA AND PROCEDURES

#### 4.1 Field Station Site Selection

The selection of sampling locations is based on several factors including type and purpose of the sample, representativeness, accessibility (permission to sample), location of existing wells, location of potential source areas of contamination and location of potential receptors. Selection criteria vary depending upon the type of medium being sampled and the purpose of the sampling which are described in site specific work plans.

#### 4.2 Field Equipment Installation

Generally KDHE field staff will use non-dedicated sampling equipment that is either disposable or reusable. Sampling equipment designated for reuse on multiple wells must be decontaminated as specified in SOP (BER-05). Most sites, in routine monitoring use dedicated sampling equipment in place. Installation (drilling and construction) of monitoring wells will be performed in accordance with the bid documents and applicable SOPs.

#### 4.3 Sampling Types

Program staff provide QA/QC management services through the collection of split, duplicate, replicate, and/or collocated environmental samples concurrent with environmental sampling performed by the O/O's environmental contractor. In addition, program staff perform field sampling at sites where a release is suspected but has not yet been confirmed. Periodically, staff perform environmental sampling at sites where the O/O has not been determined or is uncooperative.

Ground water is the most frequent environmental media sampled, followed by subsurface soils, surface water, sediment, and air. In addition, program staff may be required to collect special samples including influent and effluent water samples associated with ground water or surface water treatment systems.

Program staff collect samples for two basic reasons; field screening or for shipment to a Kansas certified laboratory for analysis. The most common type of sample which is collected for field screening within the Storage Tank Program is soil samples for Total Petroleum Hydrocarbon (TPH) screening. This screening is performed to determine if petroleum vapors are present in the soil at levels of concern.

The samples collected for laboratory analysis are primarily groundwater samples to be analyzed for Volatile Organic Compounds (VOCs) and Polycyclic Aromatic Hydrocarbons (PAHs). Water samples are tested for lead contamination where leaded gasoline is suspected to have been released. Soil samples are tested for total petroleum hydrocarbons (TPH) and VOCs. Two different methods of analysis are performed for TPH depending on the type of product which is suspected to have been released. Gas Chromatography (GC) methods are required for gasoline and diesel range hydrocarbons and infrared (IR) methods are acceptable when waste oil or motor oil is suspected. A combination of methods may be required where several different types of hydrocarbons are suspected to have been released.

All sampling must follow various SOPs regardless whether the O/O, their consultant, or KDHE staff perform the sampling. Applicable SOPs include: BER-01 for the collection of ground water samples, BER-03 for the collection of soil samples and BER-12 for sample control, i.e. identification, transport and chain-of-custody. Field screening methods are detailed in the individual bid documents.

#### 4.4 Safety Considerations

Field and laboratory staff that participate in environmental monitoring programs encounter potentially dangerous situations on a frequent basis. In addition to the routine possibility of automobile or equipment accidents, employees may encounter extremely slippery surfaces, toxic or hazardous substances, infectious microorganisms, fire or electrocution hazards, vicious animals, belligerent persons, or other threatening situations. Injuries or illnesses resulting from such situations may lead to substantial human suffering and, from a QA/QC perspective, deprive programs of the services of a valuable employee for an extended period of time.

Although it is not possible to predict every conceivable risk that may arise during the course of work, supervisors must ensure that those risks faced by staff on a recurring basis are addressed in the SOPs and are discussed during employee training. Field and laboratory staff are expected to abide by the safety protocols contained within the QA management plans and SOPs and to integrate safety considerations into all aspects of their work. Field staff should follow SOPs BER-18, BER-20 and BER-21. BER routinely budgets for ongoing safety training expenses and annual medical physicals for field staff associated with monitoring and/or field inspections of hazardous materials (refer to BER-17). Non-supervisory employees are expected to bring potentially unsafe practices or situations to the attention of their program manager. In turn, the program manager shall evaluate the practice or situation and either take the appropriate corrective action or, in complicated circumstances, seek the advice of the appropriate Section Chief or higher level supervisor. Major corrective actions (those warranting changes in an SOP) shall be implemented by staff only upon approval of the Section Chief, Bureau QA representative and may require the approval of the Bureau Director.

#### 4.5 Requesting Analytical Services

Program staff can employ several approaches for direct submission of environmental samples to a laboratory for analyses once collected. Staff can submit environmental samples directly to the Kansas Health and Environmental Laboratory (KHEL) or submit samples to one of three contract laboratories. In addition, the storage tank section also contracts both sampling and analytical services through a time and materials contract. O/Os who hire consultants to perform corrective action are required to notify KDHE regarding which laboratory will be used and which analytical methods will be employed. The project manager must approve the laboratory and method prior to initiation of work.

The selected laboratory must have a specific QA and QC plan approved by the KDHE's Laboratory Improvement Program for the methods to be used. Although there is no approved TPH analytical methods, laboratories that perform these analyses must be approved for the extraction and analytical methods used to perform the analysis.

#### 4.6 Procedures for Assessing Data Precision, Accuracy, Representativeness and Comparability

##### 4.6.1 Ongoing Quality Assurance Review and Special Audits

QA/QC aspects of the Storage Tank Program are subject to ongoing review by the Unit Leaders and Section Chief. Staff are expected to cooperate fully with administrative request for information on data precision/accuracy and overall QC performance. The Unit Leaders are expected to track the QC performance of project managers and other staff in identifying QC deficiencies associated with corrective actions. The Section Chief is expected to track the QC performance of the program, assist Unit Leaders in identifying QC deficiencies within their programs, and facilitate the initiation of necessary corrective actions. The results are reported to the applicable Bureau Manager.

##### 4.6.2 Equipment Calibration and Maintenance

All field equipment must be checked out by staff from the Bureau's Equipment and Supply Technician. The individual users of field equipment are responsible for the maintenance (in accordance with manufacturer's procedural manuals and/or standard operating procedures) of the equipment while being used in field operations. The user should ensure the equipment is checked for proper operation and is current with calibration requirements (if needed) prior to leaving for the field. The user should record any malfunctions encountered while in the field in the logbook associated with the equipment. The user should make sure the malfunctions are communicated to the Unit Leader and the Bureau Equipment and Supply Technician upon return of the equipment to storage so that the appropriate action can be initiated to repair or replace the item of equipment.



#### 4.6.3 Quality Control Blanks and Spikes

Quality control procedures are incorporated by field staff to ensure the integrity of the samples collected. Without checks on the sampling and analytical procedures, the potential exists for contradictory or incorrect results. Procedures describing quality control samples are defined in BER-12 or are included in the RFP documents governing specific projects.

Due to the very large number of sites and the frequency with which monitoring wells are sampled, the Storage Tank Program does not always perform the same level of QA/QC sampling. The RFP for these sites requires that the consultant collect duplicate samples during the initial investigation. The project manager selects some of the duplicate samples to be analyzed in separate laboratories than the consultant uses. Those results are compared with the results contained in the reported data to determine the quality of the consultant's analytical results.

The sites within this program are monitored quarterly for a minimum of one year and sometimes for several years to provide a more objective evaluation of the contaminant concentrations at the site. The results of these analyses are compared with the previous results to determine the reliability of the field work and the laboratory results. Additionally, at the end of the monitoring contract, KDHE field staff meet with the consultants who have performed the monitoring and perform split sampling of the site wells. During this sample split, the staff evaluate the methodologies observed to determine the quality of work performed to insure that the BER SOPs are followed.

The results of these split samples are also used to evaluate the quality of the analytical work performed by the program. Split sampling is also performed by KDHE field staff when the sampling results indicate that a site has reached the remediation objectives for site closure status.

#### 4.7 Corrective Action Procedures

In the context of QA, Storage Tank Section corrective actions are procedures that may be implemented on environmental samples that do not meet predetermined QA specifications. In general, the corrective action procedures program addresses the analysis of any cause precipitating a negative audit finding and identifies the appropriate corrective action(s) necessary to address it. Program staff, or the appropriate QA/QC program designee, are responsible for reviewing data validation reports, audit reports and non conformance reports, to identify significant or repetitious conditions adverse to quality, or deficiencies regarding the implementation or adherence to required QA practices. In addition, the program staff, or QA designee, is responsible for defining and/or implementing the necessary actions to remedy the problem.

The quality characteristics of data generated by sampling, monitoring, or analyzing is defined in the following terms:

Accuracy: The degree of agreement of a measurement, or an average of measurements of

the same thing,  $X$ , with an accepted reference or true value,  $T$ , usually expressed as the difference between the two values,  $X - T$ , or the differences as a percentage of the reference or true value,  $100 (X - T)/T$ , and sometimes expressed as a ratio,  $X/T$ . Accuracy is a measure of the bias inherent in the system.

Precision: A measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Precision is best expressed in terms of the standard deviation. Various measures of precision exist depending on the prescribed similar conditions.

Completeness: A measure of the amount of the valid data obtained from a measurement system, compared with the amount that was expected to be obtained under correct normal conditions, and that was needed to be obtained in meeting the project data quality objectives.

Representativeness: The degree to which data accurately and precisely represent a characteristic of population, the parameter variations at a sampling point, a process condition, or an environmental condition. It also includes how well the sampling point represents the actual parameter variations that are under study.

Comparability: The confidence with which one data set can be compared with another; a qualitative characteristic that must be assured in terms of sampling, analysis, reporting, etc.

The exact values of the quality characteristics will vary depending upon the analytical processes and procedures employed. Site specific work plans will detail the recommended field activities and analytical methodologies necessary to establish the appropriate data quality characteristics. Corrective actions may include re-sampling, re-analyzing samples or auditing laboratory procedures.

#### 4.8 Data Management

All work plans submitted in association with the Storage Tank Section are required to meet the criteria established by the project manager. Boiler plate documents are incorporated into the bid documents which are used to establish the scope of work. Reports required by these scopes of work must include field logs, sample management and tracking procedures, and document control and control and inventory procedures for both laboratory data and field measurements to ensure that the data collected during the investigation are of adequate quality and quantity to support the findings of the investigation and remedial reports.

For each measurement, the data reduction scheme planned for collected data, including all equations used to calculate the concentration or value of the measured parameter, should be described. The principal criteria employed to validate the integrity of the data collected should be validated at the appropriate level of laboratory quality control to ascertain whether it is appropriate for its intended use. All task management and quality controls implemented shall be documented within the appropriate report appendix.

#### 4.9 Quality Assurance / Quality Control Reporting Procedures

Specific QA / QC reports are not required with submittals to the Storage Tank Section due to excessive numbers of sites. QA /QC is monitored by the project managers to ensure quality data. Where anomalies are noted, laboratory QA/QC data will be requested and, if needed, follow up sampling will be performed. Many of the sites within the section purview are low risk and require somewhat less concern regarding QA/QC documentation. All sites are monitored over time so any anomalies in data should become apparent during review of project status reports. Project managers split samples with consultants at selected sites to determine where problems may exist. Higher risk sites commonly have higher levels of oversight to detect any QA/QC problems before closure is accomplished.